

WHAT IS CLAIMED IS:

1. A collapsible structure with a self-locking mechanism, comprising:
a first hub;
at least two struts pivotably connected at first ends thereof to the first hub and movable relative to each another between a folded position and an expanded position;
a tension member adapted to limit pivotable movement of the at least two struts such that, when in the expanded position, the at least two struts define an angle of less than 180°;
a locking hub; and
at least two locking struts pivotably connected at first ends thereof to the locking hub and, at seconds ends thereof, to connection points on respective ones of the at least two struts.
2. The collapsible structure as set forth in claim 1, wherein the tension member includes a wire.
3. The collapsible structure as set forth in claim 2, wherein the wire is attached to the at least two struts.
4. The collapsible structure as set forth in claim 1, wherein the tension member includes a cover attached to the collapsible structure.

5. The collapsible structure as set forth in claim 1, wherein the tension member includes a base to which the collapsible structure is attached.

6. The collapsible structure as set forth in claim 1, wherein a distance between a connection point and the first hub for any one of the at least two struts is greater than a length of a respective one of the at least two locking struts.

7. The collapsible structure as set forth in claim 6, wherein the distance between the connection point and the first hub for the one of the at least two struts multiplied by a cosine of an angle defined by a plane in which the connection points of all of the at least two struts lie and the one of the at least two struts is less than the length of the respective one of the at least two locking struts.

8. The collapsible structure as set forth in claim 1, wherein a distance between a connection point and the first hub for any one of the at least two struts multiplied by a cosine of an angle defined by a plane in which the connection points of all of the at least two struts lie and the one of the at least two struts is less than the length of the respective one of the at least two locking struts.

9. The collapsible structure as set forth in claim 1, wherein the locking struts are each adapted to pivot through an angle greater than 90° relative to the locking hub when the locking struts are moved between a folded position and a locked position.

10. The collapsible structure as set forth in claim 1, wherein there are at least three struts.

11. The collapsible structure as set forth in claim 1, wherein there are at least four struts.

12. The collapsible structure as set forth in claim 1, comprising
at least two second struts pivotably connected at first ends thereof to respective ones of the at least two struts,
at least two second hubs, second ends of the at least two second struts being pivotably connected to respective ones of the at least two second hubs,
at least two third struts, first ends of the at least two third struts being pivotably connected to respective ones of the at least two second hubs,
at least two third hubs, second ends of the at least two first struts being pivotably connected to respective ones of the at least two third hubs,
at least two fourth struts, first ends of the at least two fourth struts being pivotably connected to respective ones of the at least two third hubs and being pivotably connected to respective ones of the at least two third struts.

13. The collapsible structure as set forth in claim 12, wherein the at least two first struts and the at least two fourth struts are each adapted to pivot through an angle greater than 90° when the at least two first struts and the at least two fourth struts pivot relative to

respective ones of the at least two third hubs between a folded position and a locked position.

14. The collapsible structure as set forth in claim 12, wherein the at least two second struts are pivotably connected to respective ones of the at least two struts at the connection points on respective ones of the at least two struts.

15. The collapsible structure as set forth in claim 12, wherein the at least two second struts are pivotably connected to respective ones of the at least two struts at points between the connection points and the second ends of respective ones of the at least two struts.

16. The collapsible structure as set forth in claim 12, comprising
four struts pivotably connected at first ends thereof to the first hub and spaced relative to one another about the first hub at 90° and movable relative to each another between a folded position and an expanded position;

a tension member adapted to limit pivotable movement of the four struts such that, when in the expanded position, the four struts define an angle of less than 180° ;

four locking struts pivotably connected at first ends thereof to the locking hub and, at second ends thereof, to connection points on respective ones of the four struts;

four second struts pivotably connected at first ends thereof to respective ones of the four struts,

four second hubs, second ends of the four second struts being pivotably connected to respective ones of the four second hubs,

four third hubs, second ends of the four first struts being pivotably connected to respective ones of the four third hubs.

17. The collapsible structure as set forth in claim 16, comprising

four extension hubs,

eight extension struts, four pairs of the eight extension struts being pivotably connected at first ends thereof to respective ones of the four second hubs at right angles to the second struts and being pivotably connected at second ends thereof to respective ones of the four extension hubs, and

eight extension arms, four pairs of the eight extension arms being pivotably connected at first ends thereof to respective ones of the four third hubs at right angles to the first struts and each of the eight extension arms being pivotably connected at second ends thereof to respective ones of the eight extension struts.

18. The collapsible structure as set forth in claim 17, comprising

four fourth hubs, second ends of the four fourth struts being pivotably connected to respective ones of the four fourth hubs,

four fifth struts, first ends of the four fifth struts being pivotably connected to respective ones of the four fourth hubs,

four fifth hubs, second ends of the four third struts being pivotably connected to respective ones of the four fifth hubs,

four sixth struts, first ends of the four sixth struts being pivotably connected to respective ones of the four fifth hubs, the four sixth struts being pivotably connected to respective ones of the four fifth struts.

19. The collapsible structure as set forth in claim 18, wherein the four third struts and the four sixth struts are each adapted to pivot through an angle greater than 90° when the four third struts and the four sixth struts pivot relative to respective ones of the four fifth hubs between a folded position and a locked position.

20. The collapsible structure as set forth in claim 12, comprising
at least two fourth hubs, second ends of the at least two fourth struts being pivotably connected to respective ones of the at least two fourth hubs,
at least two fifth struts, first ends of the at least two fifth struts being pivotably connected to respective ones of the at least two fourth hubs,
at least two fifth hubs, second ends of the at least two third struts being pivotably connected to respective ones of the at least two fifth hubs,
at least two sixth struts, first ends of the at least two sixth struts being pivotably connected to respective ones of the at least two fifth hubs, the at least two sixth struts being pivotably connected to respective ones of the at least two fifth struts.

21. The collapsible structure as set forth in claim 20, wherein the at least two third struts and the at least two sixth struts are each adapted to pivot through an angle greater than 90° when the at least two third struts and the at least two sixth struts pivot

relative to respective ones of the at least two fifth hubs between a folded position and a locked position.

22. The collapsible structure as set forth in claim 21, further comprising a stop for preventing the locking hub from moving beyond a locking position in the expanded position.

23. A method of erecting a collapsible structure, comprising:
unfolding a collapsible structure from a folded condition to a collapsed condition;
fixing a plurality of base-defining ends of a plurality of end struts of the collapsible structure in the collapsed condition to points on a surface, the points generally defining a size of a base of the structure in the erected condition;
after fixing the base-defining ends to the points on the surface, lifting a center region of the collapsible structure to an erected height of the collapsible structure; and
locking the collapsible structure in an erected condition after lifting the structure to its erected height using an internal locking arrangement of the collapsible structure.

24. The method of claim 23, wherein the internal locking arrangement includes a first hub, at least two struts pivotably connected at first ends thereof to the first hub and movable relative to each another between a folded position and an expanded position, a tension member adapted to limit pivotable movement of the at least two struts such that, when in the expanded position, the at least two struts define an angle of less than 180° , a locking hub, and at least two locking struts pivotably connected at first ends thereof to the

locking hub and, at second ends thereof, to connection points on respective ones of the at least two struts, the method including pivoting each of the locking struts relative to the locking hub through an angle greater than 90° between a folded position of the locking struts when the collapsible structure is in the folded condition and a locked position of the locking struts when the collapsible structure is in the erected condition.